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ABSTRACT

The second in a series of papers on a study of the environmental setting of learning disabled (LD) adolescents and young adults reports research on cognitive and academic functioning of 234 LD, 162 low achieving (LA), and 215 normally achieving (NA) secondary students and on socioeconomic status and school experiences. Data were obtained from Ss and their parents on student performance, differences between junior and senior high school levels, differences between LD and LA Ss, and the extent of underachieving in LA and LD groups. Among findings were that across four measures of socioeconomic status, there were no significant differences between LA and LD groups; that for junior high samples, LD Ss appeared to be underachieving to a greater extent, while for senior high Ss underachievement appeared equal for LD and LA groups; and that no differences were found among LA, LD, and NA groups on the variety and constancy of school experience. Tables with statistical data are included. (SB)

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AN EPIDEMIOLOGICAL STUDY OF LEARNING DISABLED ADOLESCENTS IN SECONDARY SCHOOLS: ACHIEVEMENT AND ABILITY, SOCIOECONOMIC STATUS, AND SCHOOL EXPERIENCES

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The University of Kansas Institute for Research in Learning Disabilities is supported by a contract (#300-77-0494) with the Bureau of Education for the Handicapped, Department of Health, Education, and Welfare, U. S. Office of Education, through Title VI-G of Public Law 91-230. The University of Kansas Institute, a joint research effort involving the Department of Special Education and the Bureau of Child Research, has specified the learning disabled adolescent and young adult as the target population. The major responsibility of the Institute is to develop effective means of identifying learning disabled populations at the secondary level and to construct interventions that will have an effect upon school performance and life adjustment. Many areas of research have been designed to study the problems of LD adolescents and young adults in both school and non-school settings (e.g., employment, juvenile justice, military, etc.)

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Cooperating Agencies

Were it not for the cooperation of many agencies in the public and private sector, the research efforts of The University of Kansas Institute for Research in Learning Disabilities could not be conducted. The Institute has maintained an on-going dialogue with participating school districts and agencies to give focus to the research questions and issues that we address as an Institute. We see this dialogue as a means of reducing the gap between research and practice. This communication also allows us to design procedures that: (a) protect the LD adolescent or young adult, (b) disrupt the on-going program as little as possible, and (c) provide appropriate research data.

The majority of our research to this time has been conducted in public school settings in both Kansas and Missouri. School districts in Kansas which are participating in various studies include: United School District (USD) 384, Blue Valley; USD 500, Kansas City; USD 469, Lansing; USD 497, Lawrence; USD 453, Leavenworth; USD 233, Olathe; USD 305, Salina; USD 450, Shawnee Heights; USD 512, Shawnee Mission, USD 464, Tonganoxie; USD 202, Turner; and USD 501, Topeka. Studies are also being conducted in Center School District and the New School for Human Education, Kansas City, Missouri; the School District of St. Joseph, St. Joseph, Missouri; Delta County, Colorado School District; Montrose County, Colorado School District; Elkhart Community Schools, Elkhart, Indiana; and Beaverton School District, Beaverton, Oregon. Many Child Service Demonstration Centers throughout the country have also contributed to our efforts.

Agencies currently participating in research in the juvenile justice system are the Overland Park, Kansas Youth Diversion Project and the Douglas, Johnson, and Leavenworth County, Kansas Juvenile Courts. Other agencies have participated in out-of-school studies--Achievement Place and Penn House of Lawrence, Kansas, Kansas State Industrial Reformatory, Hutchinson, Kansas; the U.S. Military; and the Job Corps. Numerous employers in the public and private sector have also aided us with studies in employment.

While the agencies mentioned above allowed us to contact individuals and supported our efforts, the cooperation of those individuals--LD adolescents and young adults; parents; professionals in education, the criminal justice system, the business community, and the military--have provided the valuable data for our research. This information will assist us in our research endeavors that have the potential of yielding greatest payoff for interventions with the LD adolescent and young adult.

AN EPIDEMIOLOGICAL STUDY OF LEARNING DISABLED ADOLESCENTS IN SECONDARY SCHOOLS

Abstract

In recent years, professionals in the field of learning disabilities have begun to address the impact of learning disabilities on adolescents and young adults. Although substantial attention has been directed to the manifestations of learning disabilities in elementary school age populations, the significantly different and increasingly complex demands on adolescents both in and out of school necessitate the development of systematic research on this population. The University of Kansas Institute for Research in Learning Disabilities has collected a broad array of data to form an epidemiological data base on LD adolescents and young adults. Data have been collected from learning disabled, low-achieving, and normal-achieving adolescents as well as from their parents and teachers. In addition, information from the environmental setting of the LD adolescents which pertains to interventions applied on behalf of the student, relationships with others, conditions under which he/she operates and support systems available for his/her use has also been collected. These data have been considered in relation to data on specific learner characteristics to gain a more complete profile of the older LD individual.

Research results presented in Research Reports 12 through 20 detail findings from this comprehensive epidemiology study conducted during 1979-80 by the Institute. It is important for the reader to study and view each of these individual reports in relation to this overall line of research. An understanding of the complex nature of the learning disability condition only begins to emerge when each specific topic or finding is seen as a partial, but important, piece of a larger whole.

The specific aspects of the total study presented in individual Research Reports are listed below:

Research Report No. 12:	Details of the Methodology
Research Report No. 13:	Achievement and Ability, Socioeconomic Status, and School Experiences
Research Report No. 14:	Academic Self-Image and Attributions

Research Report No. 15:	Health and Medical Factors
Research Report No. 16:	Behavioral and Emotional Status from the Perspective of Parents and Teachers
Research Report No. 17:	The Relationship of Family Factors to the Condition of Learning Disabilities
Research Report No. 18:	Social Status, Peer Relationship, Activities In and Out of School, and Time Use
Research Report No. 19:	Support Services
Research Report No. 20:	Classification of Learning Disabled and Low-Achieving Adolescents

AN EPIDEMIOLOGICAL STUDY OF LEARNING DISABLED ADOLESCENTS IN SECONDARY SCHOOLS:

ACHIEVEMENT AND ABILITY, SOCIOECONOMIC STATUS, AND SCHOOL EXPERIENCES

Since the inception of the learning disability field in the early 1960s, emphasis for treatment and intervention has been on younger children. Only recently has attention been turned to addressing the educational and life adjustment needs of adolescents and young adults as well (Alley & Deshler, 1979). A prerequisite step to developing sound instructional systems and procedures for the older-aged learning disabled is for the field to achieve a thorough understanding of the complex nature of the condition of learning disabilities in older populations.

There are some unique problems related to adolescents with learning disabilities (LD) which have not been adequately addressed within the research on learning disabilities in elementary populations. Among these are the following. The demands of the curriculum in secondary schools or job requirements in employment settings are significantly different from the demands placed on LD students in elementary settings. Thus, the manifestations of the specific learning disability may be altered. Second, there are many variables associated with the condition of learning disabilities. It would appear that the complexity and interaction of these increase as the adolescent moves from school to non-school settings and as the number and variety of his/her social groupings increase (Deshler, 1978). Thirdly, there is very little knowledge

about the conditions confronting the LD adolescent and young adult in non-school settings and the degree to which these individuals can cope with these circumstances.

The complex nature of the condition of learning disabilities and the unique features of the conditions and the environment facing the LD adolescent and young adult demonstrate the need for systematic research on this population. Therefore, the purpose of a major line of research conducted by The University of Kansas Institute for Research in Learning Disabilities has been to collect a broad array of data to form an epidemiological data base on older LD populations. Data have been collected from the environmental setting of the LD adolescent which pertain to interventions applied on behalf of the student, conditions under which he/she operates, and support systems available for his/her use. These data have been considered in relation to data on specific learner characteristics to gain a more complete profile of the older LD individual.

Research results presented in Research Reports 12 through 20 detail findings from this comprehensive epidemiology study conducted during 1979-80 by the Institute. It is important for the reader to study and view each of these individual reports in relation to this overall line of research. An understanding of the complex nature of the learning disability condition only begins to emerge when each specific topic or finding is seen as a partial, but important, piece of a larger whole.

The purpose of this research report is to summarize findings from the epidemiological study which pertain to three types of variables: ability and achievement tests, socio-economic status, and variables related to the number and types of schools attended.

By the time students reach adolescence, previous developmental functions should have been systematically integrated so that students are capable of performing complex tasks with high efficiency. These characteristics that define the learning processes of disabled learners have not been adequately researched (Bryant & Kass, 1972); however, it does appear that disabilities at this level show a lack of hierarchical acquisition of functions associated with normal academic achievement. The focus of training in the basic skills: reading, spelling, language, and arithmetic must address application of these skills rather than acquisition alone. When basic skills have not been integrated by adolescence, performance in the secondary school will undoubtedly be affected, because academic materials and teaching styles at this level are more complex and demand a synthesized, efficient utilization of skills. Recent research at The University of Kansas Institute for Research in Learning Disabilities has shown that the prevalent teaching method in core subjects in secondary schools is the lecture format (Moran, 1980). This format requires that students integrate not only the content but also attention, listening, and note-taking skills.

Learning disabled (LD) students are commonly thought to have a profile of academic abilities that reflects both strengths and weaknesses. A silhouette of the LD adolescent as possessing varying abilities and exhibiting inconsistencies in performance has been described by several authors (Gordon, 1969; Siegel, 1974). This position suggests that LD adolescents do not have a suppressed profile in all areas of academic functioning.

Several authors have suggested that poor performance on measures of cognitive ability by LD adolescents may be the result of an

inability to learn at the same rate as their normal-achieving peers (Brutten, Richardson, & Mangel, 1973; Myklebust, 1973). A report on compensatory education from the Stanford Research Institute hypothesized that poor performance of some high school students may result from maturational delays. An alternative explanation for lower performance at the secondary level relates to the long-term effects of remedial strategies. Remedial strategies generally emphasize a student's weaknesses while ignoring his/her strengths. Such an approach may neglect areas of integrity resulting in a depression of these strongholds of positive ability. Instead of bringing weaknesses into closer proximity with strengths, remediation may result in reducing strengths toward the level of weaknesses.

Assessment of these positive areas should emphasize the process by which one learns rather than the products one produces as a more meaningful index of cognitive abilities and learning potential. Cognitive functioning must be perceived not in terms of a decrease in potential but rather as an inability to achieve at a normal rate. Apparent changes in cognitive abilities as a function of age may also be the result of the assessment procedures used to measure these changes. Procedures that emphasize the process by which one learns may be a more meaningful index of cognitive abilities than traditional product assessment.

Achievement in the secondary school requires that integrities in cognitive abilities be applied in specific skill areas related to reading, writing, spelling, speaking, listening, and mathematics. Many authors have noted LD students' deficiencies in these areas (Boder, 1971; Deshler, 1974; Hagin, 1971; Karlsen, Madden, & Gardner,

1966; Myklebust, 1973). Especially important to performance in the secondary school is the area of written expression. Moran found that students at that level are given limited opportunities to respond verbally and were most often asked to indicate mastery of material in a written format. Written language skills are tapped in a number of ways, through notetaking, outlining, production of themes and essays, as well as performance on written tests.

In addition, secondary school classrooms which are heavily lecture oriented place heavy demands on students' listening skills. Deficits in this area among LD students have been described by Hagin and Myklebust among others. Reports of performance in related areas such as vocabulary facility among LD adolescents have also been described. Myklebust reported that reading disabled adolescents performed approximately six years below expected levels when asked to supply antonyms or to give definitions of words. Deshler, however, reported that performance of normal high school students on a vocabulary error detection task (selecting synonyms) was only slightly higher than the performance of LD students. He suggested that the nature of the tasks must be considered in interpreting these results. Vocabulary is highly correlated with measures of intelligence and normal or near nromal intelligence is, by definition, an assumption basic to the condition of learning disabilities. Such a relationship may account for the performance of LD students on this task.

The purpose of the study described here was to investigate the cognitive and achievement functioning of three groups of secondary students: (a) learning disabled, (b) low achievers, and (c) normal achievers. In addition, information about socioeconomic status and school experiences is provided.

Methodology

Subjects

Three groups of adolescents and their parents participated in this part of the study. The adolescents included LD students, low-achieving students, and normal-achieving students in grades 7, 8, 9, 10, 11, and 12. LD students were those currently being served in programs for learning disabled students and validated by the IRLD Validation team. Low-achieving (LA) students were students who had recently received one or more failing grade in required subjects, scored below the 33rd percentile on group administered achievement tests, and who were not receiving special educational services. Normal-achieving (NA) students were those who had passing grades, scored above the 33rd percentile in achievement, and who were not receiving special educational services. Data in the present report only includes normal-achieving students in grades 10, 11, and 12. The students and their parents agreed to participate in this study. For more details on student selection, see The University of Kansas Institute for Research in Learning Disabilities Research Report No. 12 (Schumaker, Warner, Deshler, & Alley, 1980). Two hundred thirty-four LD students and 162 of their parents, 222 low-achieving students and 144 of their parents, and 215 normal-achieving students[1] and 184 of their parents took part.

Settings

Three school districts in northeast Kansas agreed to participate (USDs #500, #512, and #202). The students provided information for this study in small, quiet rooms selected by their schools. Parents provided information at their leisure at home. (For more information

regarding settings see Schumaker et al., 1980.)

In the present report, data are provided which pertain to two districts, one which is generally considered to be a high socio-economic status district and another in which students came predominantly from families of lower socio-economic status.

Measurement Systems

Variables to be reported herein were drawn from selected ability and achievement tests and from two assessment instruments: the Youth and Parent Instruments. Both of the assessment instruments were designed with a number of questions regarding parent-child interactions, family conditions, and child perceptions of parent behavior. A number of different answer formats were used in the questions. Some involved Likert-type scales, others involved multiple-choice answers, and still others allowed open-ended responding. (For more information about the instruments see Schumaker et al., 1980.)

The specific items from these instruments which make up the variables to be discussed in the present report are as follows. Two types of information pertaining to socioeconomic status from the Youth Assessment Instrument, are discussed in the present report. Each youth was presented with a list of 17 household objects and asked to check whether or not each one was present in his/her home. The sum of objects checked as present served as a variable called HOMESUM. In addition, on the same instrument, students were asked to respond to the following two questions:

In all, how many rooms are there in your home? _____rooms

In all, how many people live in your home? _____people

The variable RATIO consisted simply of ratio of number of rooms to the number of people reported.

Four types of information from Parent Assessment Instrument are analyzed in the present report, two pertaining to socioeconomic status, and two pertaining to the variety and constancy of school experiences. Each parent was asked to indicate his/her occupation and that of his/her spouse. These occupations were coded according to Duncan's socioeconomic index (Reiss, Duncan, Hatt, & North, 1961). Based on the sex of the respondent a variable was created called FATHOCC, which represented the status of the youth's father's occupation. Each parent respondent also was asked to respond to the following question twice, once for himself or herself and once with reference to his/her spouse.

Please specify the highest level of education you have achieved:

Grade school. 1
Some high school. 2
High school diploma or GED. 3
Trade or vocational school certificate. .4
Some college. 5
College degree. 6
Graduate or professional degree 7

The respondent's answer to both questions were summed to create a variable called TPAREDUC.

Two variables from the Parent assessment instrument which pertain to the variety and constancy of the youth's school experiences were derived as follows. Parents were asked to respond to the following questions:

Did your son or daughter go to any of the following:

	No	Yes
Day care	1	2
Preschool or nursery school	1	2
Kindergarten	1	2
Special Classes	1	2
Summer school	1	2

The sum of the activities circled yes constituted a variable called SUMOSCH.

Finally, each parent was asked:

How many different schools has your son/daughter attended since entering kindergarten? _____schools

This variable was labeled PNDIFSCH.

In addition to reporting information concerning socioeconomic status and school experiences, performance on selected tests of ability and achievement are discussed in the present document. Ability and achievement data for the normal-achieving sample were gleaned from school records. For the most part, ability testing was completed when normal-achieving students were in the ninth grade. For achievement testing, students were typically either in eighth or tenth grade at the time of testing. Specific outcomes of the testing are covered in the Results section of the document.

For the LD and low-achieving samples, each student was administered selected subtests of the Woodcock-Johnson Psycho-educational Battery (Woodcock & Johnson, 1977). All the subtests from the Reading, Mathematics, and Written Language clusters were administered, and three cluster scores were derived. In addition, each student,

depending on their age, was given the Vocabulary and Block Design subtest of either the WISC-R or the WAIS. Scaled scores on each of the two subtests were computed, and these scales scores were combined to provide an estimate of the students' Full Scale I.Q. For details pertaining to ability and achievement test data and how these data were derived, the reader is referred to Research Report Number 12.

Procedures

In individual sessions, the students were read the questions (and possible answers) by an interviewer. The students' responses were recorded on the instrument either by the interviewer or the student, whichever the student preferred. The parent instruments were either mailed or carried home by the students. Follow-up letters and phone calls were made when necessary.

Data Analysis

The University of Kansas Institute for Research in Learning Disabilities Research Reports which present data from the first phase of the comprehensive Level I epidemiological study are numbered (including the present report) 12 through 20. A thorough discussion of the specific procedures used in data analysis for the complete study as well as the rationale for those procedures is contained in Research Report Number 12, Details of the Methodology (Schumaker et al., 1980). The following comments are condensed from that report.

In general, two types of variables are discussed in Research Reports 12-20: (a) individual items from the Youth, Parent, or Regular Teacher Assessment Instruments, or specific ability or achievement test scores and (b) FSCALES. The FSCALES were derived by

equally weighting and averaging performance on two or more items from one of the assessment instruments. Based on a factor analysis of each assessment instrument, items were combined into an FSCALE if they had a moderate to strong loading on the same factor. A complete listing of the items which made up each FSCALE is contained in Research Report Number 12.

In order to test for significant group differences on individual assessment instrument items, test scores, or FSCALES, the following procedure was adopted. The BMDP7D computer program (Dixon, 1975) was used to conduct a univariate F test for each variable under consideration. For each variable, if the p value associated with F was less than or equal to .01, confidence bands for each mean were constructed. Two standard errors of the mean ($SE = SD/\sqrt{n}$) were added and subtracted from each mean. If the confidence bands for a given pair of means did not overlap, the means were considered significantly different.[2]

In addition to the data analysis procedures just described, other types of data analysis were utilized in the present report. First, in order to test for district effects (districts A and B) and their possible interaction with classification (LD-low achiever) and level (Junior High-Senior High), a three-way analysis of variance was performed separately for each of four dependent variables, the estimated I.Q., and the three Woodcock-Johnson cluster scores. The BMDP2V computer program was used to conduct these analyses. Also, based on national norms from the Woodcock-Johnson and Wechsler test manuals, percentile ranks and grade equivalents for groups are presented.

Research Questions

The data covered in this report were analyzed with several specific research questions in mind. These questions were as follows:

1. Are there significant differences between the performance of the three groups on each of the variables analyzed in this report?
2. Are differences consistent across the junior high and senior high school levels?
3. For the ability and achievement test data, do differences in performance of the LD and low-achievement samples exist across school districts?
4. For ability and achievement test data, what are the performances of low-achieving and LD students in terms of grade equivalents and percentile ranks?
5. To what extent are low-achieving and LD groups "underachieving" and is one group underachieving to a greater extent than the other?

Results

The results reported here are organized into three sections. Each section is concerned with a different set of variables. Variables discussed include: (a) those associated with socioeconomic status, (b) those associated with achievement and ability tests and (c) those associated with variety of school experiences.

Socioeconomic Status

A number of questions were asked of students and parents to ascertain the socioeconomic status of families and the "richness" of the home environment. The results associated with these variables are presented in Table 1 for the junior high students and Table 2 for the senior high students.

Insert Tables 1 and 2 about here

For the variable HOMESUM (the total number of objects that a student reported as being present in the home) the mean for the normal-achieving senior high school group was significantly higher than the means of the other two senior high school groups. For both the junior high and senior high school samples, there was no significant difference between low-achieving and LD groups. The pattern of significant differences reported for HOMESUM is identical for two of the other S.E.S. variables, RATIO (the ratio of the member of rooms in the home to the number of people, as reported by the youth), and total parent education, the sum of the educational level of the parent respondent and his/her spouse (TPAREDUC). For the variable, father's occupation (the status of the father's occupation as measured by Duncan's index) (FATHOCC), the only significant difference was between the means of the LD and normal-achieving groups in the senior high school sample. In summary, across four measures of socioeconomic status there were no significant differences between the low-achieving and LD groups. The normal-achieving senior high school sample exhibited higher socioeconomic status on all four of the indicators.

Ability and Achievement Test Data

Ability and achievement data were taken from school records for the normal-achieving high school sample. Percentile ranks for the Differential Aptitude Test (DAT) and for the composite score on the Stanford Achievement Test (SAT) were obtained. Based on a sample of

206 students, the mean percentile rank on the DAT was 67.25. The median percentile rank was 73.00, with a standard deviation of 23.88. Scores ranged from 10 to 99, with most scores clustering at the upper end of the distribution. On the SAT, 202 scores were available. The mean percentile rank was 74.94 and the median was 80.00. The standard deviation was 19.67. Scores ranged from 34 to 99, and again the preponderance of scores clustered at the higher end of the distribution. As a group then, the normal-achieving sample was above the national average in both measured ability and achievement.

Further analyses to be presented are limited to Woodcock-Johnson and Wechsler scale test results for the low-achieving and LD samples. In Table 3, means, standard deviations and F ratios are presented for the achievement and ability tests for the junior high sample. In Table 4 the same data appears for the senior high school sample. For the senior high school sample, the means for low-achieving groups were significantly higher on all four of the ability and achievement measures. At the junior high level, the low-achieving group demonstrated significant superior performance on the three Woodcock-Johnson clusters, but not on estimated I.Q.

Insert Tables 3 and 4 about here

A separate analysis of the subtests of estimated I.Q., that is, Vocabulary and Block Design, was conducted. The results are presented in Tables 5 and 6. F tests were not conducted for comparison of the means, but confidence bands

Insert Table 5 and 6 about here

were constructed according to the procedures cited earlier. At the senior high level, the mean performance of the low-achieving group was significantly higher than the mean performance of the LD group on both the Vocabulary and the Block Design subtests. At the junior high level, such differences were not statistically significant for either subtest.

A further consideration was the differences in achievement and ability that might be apparent across the two school districts from which data for the present study was collected. District effects were analyzed separately for each of the three achievement cluster scores and for estimated I.Q. As mentioned, a three-way ANOVA was employed for each analysis. The means and standard deviations associated with these analyses are reported in Tables 7 through 10. The results of the ANOVAs themselves are presented in Tables 11 through 14. As can be seen, the district main effect was significant for all four of the achievement/ability variables. Mean performance of students in district B was significantly below that of students in district A on each of the four variables.

Insert Tables 7, 8, 9, 10, 11, 12, 13, and 14 about here

Across the four dependent variables, each of the main effects for Classification (LD vs. low achievers) and Level (Junior High

vs. Senior High) are also significant at alpha = .01. Of the many interactions tested only one was significant at alpha = .01. That is, with estimated I.Q. as the dependent variable, there was a significant interaction between Classification and District. This interaction is depicted in Figure 1. As can be seen the mean for low achievers in District A is considerably higher than the mean for LD students in District A, whereas for District B, this difference is not apparent.

Insert Figure 1 about here

Tables 15 through 17 present the means, standard deviations, and grade equivalents for the low-achieving and LD groups at each of six grade levels--7 through 12. These tables display performance on the Reading, Mathematics, and Written Language clusters respectively.

On the Reading cluster, mean performance of the low-achieving group did not rise above the sixth grade level. For the LD group, mean performance did not rise above the fourth grade level. Roughly, the same generalizations could be made for the performance of the two groups on the Written Language cluster. For the Mathematics cluster, the low-achieving group maintained about a two-year superiority over the LD group, although the performance of both groups seemed to be higher on this cluster as measured by grade equivalents. (Data to be presented in terms of percentile ranks suggests that performance within each group is depressed equally across all three achievement areas.)

Insert Tables 15, 16, and 17 about here

Tables 18 and 19 present data relevant to discrepancies between ability and achievement. In order to ascertain, in a global fashion, the extent to which various samples were underachieving, the following procedures were implemented. First, and as shown at the top of Table 18, the mean I.Q. of each of four samples was converted to its percentile rank equivalent. Then, for each of the three Woodcock-Johnson cluster scores, the median percentile rank of each group was entered in the same table. It is apparent from this table that the median percentile rank of the LD groups across all three achievement tests is below the 10th percentile. For the low-achieving groups, median performance across the three achievement areas ranges from 13 to 19.

Insert Tables 18 and 19 about here

Data pertaining to percentile equivalents of mean estimated I.Q.s were of additional interest. For both the low-achieving and LD groups, the percentile equivalents are higher for the senior high than for the junior high samples. However, whereas for the LD sample the improvement is 10 percentile ranks, for the low-achieving group the improvement is 22 percentile ranks.

For each of the four samples, the median percentile rank for each achievement test was subtracted from the percentile rank equivalent of the mean estimated I.Q. The resulting differences

are presented in Table 19. For all four samples, underachievement occurs in all three achievement areas. For the junior high samples, the LD students appear to be underachieving to a somewhat greater extent. For the senior high school sample, underachievement is more pronounced than for the junior high sample. The underachievement appears equal for the LD and low-achieving groups in the senior high school sample.

Insert Table 19 about here

Variety and Constancy of School Experience

Two variables from the Parent Assessment Instrument were associated with the variety and constancy of school experience. One pertained to the variety of preschool and school experience, SUMOSCH, the other to the number of different schools attended since kindergarten, PNDIFSCH. The results pertaining to these two variables are presented in Tables 20 and 21 for the junior high and senior high samples respectively. No significant differences were found between any of the three groups: low-achieving, LD, and normal-achieving, at either the junior high or senior high levels.

Insert Tables 20 and 21 about here

Discussion

Very little data exists of any epidemiological nature pertaining to the characteristics of and conditions surrounding LD adolescents.

In addition, differences between these adolescents (as they are being identified and served in public schools) and other low-achieving adolescents are not reported to any extent in the research literature. In the present report, data are presented which compare low-achieving, LD, and normal-achieving youths on three types of variables: (a) those pertaining to socioeconomic status, (b) those pertaining to performance on ability and achievement tests, and (c) those pertaining to variety and constancy of school experience. The data have been analyzed in order to shed light on a number of research questions.

The first and second research questions, pertaining to significant groups differences at the junior and senior high levels, can be discussed with respect to each of the three types of variables considered in this report. Concerning socioeconomic status, the most important finding was that no significant differences between the low-achieving and LD groups appeared on any of the four indicators of S.E.S. This finding occurred at both the junior high and senior high levels. On the other hand, the normal-achieving senior high sample maintained consistently high socioeconomic status across the four indicators. In this instance, it is important to keep in mind that group differences are confounded with district effects. That is, the normal-achieving sample was drawn from the one high school in a university community. However, one would expect achievement (part of the criterion for group selection) to be moderately correlated with indicators of socioeconomic status.

With respect to ability and achievement test scores, the average performance of LD students was significantly below that of the low achievers on each of the three Woodcock-Johnson achievement clusters

at both the junior high and senior high levels. With respect to estimated I.Q., LD students performed significantly more poorly than low achievers at the senior high level, but not at the junior high level. The measured ability of senior high students was considerably higher than that of the junior high students, although achievement remained uniformly low for students at both levels.

The differences between the average I.Q. of the junior and senior high samples was especially pronounced for the low-achieving sample. Several different factors, singularly or in combination, could account for these differences across levels.

One of these, which seems most plausible, is that for both low-achieving and LD groups, lower ability students drop out of school at a faster rate than higher ability students, accounting for relatively higher estimated I.Q. scores for both groups. On the other hand, this trend seems to be most pronounced for the low-achieving group. If this is true, then it may be the case that the provision of LD services tends to reduce the rate at which students with lower ability drop out. Such a hypothesis would only be confirmed by following the groups though school in a longitudinal fashion.

The mean performance of the LD students, on estimated I.Q., both at the junior high and senior high levels is substantially below the normative mean of 100. It suggests that a substantial proportion of students who are being served in secondary LD programs have problems that extend beyond difficulties with academic achievement, and that in fact several of these students might more appropriately be considered "slow learners".

Turning to discussion of variables associated with the variety and constancy of school experiences, no significant group differences were found on the two variables considered. It may be true that for some students in public schools, this low achievement may be a function of the disruption of several changes in schools attended, but in the present data, such information does not seem to be related to membership in the three sample groups under discussion.

In summary, with one exception, group differences (or the lack of these) found within the junior high sample were also found within the senior high sample. The exception was in the area of measured ability, which served to differentiate low-achieving and LD groups at the senior high level, but not at the junior high level.

With respect to the third research question, clear differences in performance on ability and achievement measures were found across the two school districts involved in this study. As described earlier, District A is considered to be located in a higher socioeconomic area than District B. It appears that within each district, those students who are lowest in achievement (compared to to other low achievers in that district) are more likely to be found receiving LD services. Thus a student who was relatively low in achievement in one district, might not be so low in another, the result being that provision of services would be contingent on the district of attendance. Although such a hypothetical situation would have to be substantiated by other research data, the implications are not promising for those who seek consistency of LD critieria.

The fourth research question concerned the ability and achievement performance of low-achieving and LD groups as measured by grade equivalents and percentile ranks. Here, some integration of the results is called for. Considering grade equivalents, across both groups, performance of the high school students is higher than that of junior high students. However, for LD students especially, little increased performance across the three academic areas can be found between the eighth and twelfth grades. This is true in spite of the fact that the students in this study are of higher ability at the senior high level than at the junior high level.

An important question for further research would be to determine the source of this "plateauing" phenomenon (which occurs in the low-achieving sample as well after 9th grade). If the same individuals tend to remain in LD placement throughout their secondary school years, and if these individuals are receiving special instruction in basic skill areas, then it could be argued from the present data that the outcomes of this instruction are not particularly promising.

Switching to the perspective provided by the percentile rank data, it can be said that for both groups, low-achieving and LD, their low standing (relative to their grade peers in the norming sample) is constant across the junior high and senior high levels.

The fifth and final research question is concerned with the achievement performance of the LD and low-achieving students relative to their measured ability. A more comprehensive analysis of discrepancy scores is planned as part of a future KU-IRLD research report. For the present, however, a general character-

ization of the data, with respect to discrepancy or underachievement can be made. First, and importantly, both the low-achieving and LD groups could be described as underachieving. This outcome is not surprising, when one considers the phenomenon of regression to the mean. That is, in both samples, extreme groups were selected with respect to achievement. Because of the imperfect correlation between measured ability and achievement our best estimate of the average ability level of both groups will be somewhat closer to the mean than their achievement scores. With respect to the junior high sample the LD group appears to be underachieving to a greater extent than the low-achieving group (although a statistical test of this difference was not made). For the high school sample, however, no such difference between the groups in underachievment was noted. It is likely, then, although confirmation awaits further analyses, that a discrepancy criterion would be of only moderate utility in discriminating LD and low-achieving samples at the junior high level and of no utility in discriminating these groups at the senior high level.

In summary, the LD students in the present study do not appear to differ from low-achieving students with respect to socioeconomic status or variety and constancy of school experiences. They do appear to be lower than low-achieving students in the three achievement areas measured and in estimated IQ at the senior high level only. The average performance of LD students in ability and achievement does appear to be affected by the district in which they are found. Whereas the achievement of senior high school LD students is higher than that of their junior high counterparts, they maintain their

relatively low standing across these levels. They perform on the average at below the fifth grade level on the Reading and Written Language clusters, and at the sixth grade level on the Mathametics cluster (after the eighth grade). Whereas they are underachieving and this underachievement is more pronounced at the high school level, it does not appear that the underachievement will serve to differentiate them from other low-achieving students not served in special education.

From one perspective, the present data do not strongly support the concept of a unique subgroup of low-achieving students that should be labeled "LD", however, there is an alternative view which holds promise. In this alternative view, it can be hypothesized that within each school district some proportion of those students who are most dysfunctional in secondary school settings are being identified and served in LD programs. That is, it is not difficult to argue that in these circumstances this group of students is in need of the kind of support services offered in special education, particularly in light of the reading and writing demands made on students in secondary schools. It would be important in this context to try to identify sub-groups within the low-achieving population and to match these sub-groups to instructions which are maximally effective for each. Thus, research activities which should follow the present effort are as follows:

1. Many of the implications of the present data can only be clarified by following students through their secondary school years in a longitudinal fashion.

2. An attempt should be made to identify sub-groups of very low achievers--be these low achievers found in or

out of special education programs.

3. The sub-groups should be sought out, and initially conceptionalized in terms of potential interventions and programs which might optimally effect their performance.

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Footnotes

[1]This includes 60 normal-achieving junior high students for whom data have not been analyzed to date.

[2]Because of the large number of means that are being compared, in the epidemiology study as a whole, it is likely that some of these will be "significantly" different on the basis of sampling error alone. A cross-validation study is currently under way in an attempt to substantiate differences found in Research Reports 13-20.

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The process of data collection in a study as large as the Epidemiology Study is a complex one. Many research assistants spend numerous hours searching through school files, contacting teachers and parents, testing students, and scoring tests. The assistance of these individuals is gratefully acknowledged. In particular, the following individuals made major contributions to the procedures and communications with the school districts and with school personnel: Pegi Denton, Bob LaGarde, Patty Lee, Tes Mehring, Sue Nolan, John Schmidt, and Alice Vetter.

TABLE 1

Means, Standard Deviations, and F-ratios for variables associated with Socio-Economic Status of Low-Achieving, and LD Junior High School Students

Variable No.	Variable Name		Low Achieving	LD	F	Overlap?[1]
10 (Youth)	HOMESUM	Mean =	13.57	13.51		YES
		SD =	2.30	2.21		
		n =	110	111	.056	
117 (Youth)	RATIO	Mean =	2.036	2.038	< .0001	YES
		SD =	.829	.743		
		n =	105	111		
158 (Parent)	FATHOCC	Mean =	51.18	52.47		YES
		SD =	33.90	31.52		
		n =	66	66	0.0511	
160 (Parent)	TPAREDUC	Mean =	6.86	7.72		YES
		SD =	2.79	2.83		
		n =	70	74	0.59	

[1] Confidence bands were created by adding and subtracting 2 Standard Errors of the Mean from each mean.

TABLE 2

Means, Standard Deviations, and F-ratios for variables associated with Socio-economic status of Low-achieving, LD, and Normal-achieving High School Students.

Variable No. and Name	Low-Achieving	LD	Normal Achieving	F	Non-Overlap[1]
10 (Youth) HOMESUM	Mean = 13.66	14.03	15.08		
	SD = 2.76	2.06	1.30		
	n = 67	77	184	18.0155**	B,C
117 (Youth) RATIO	Mean = 2.214	2.23	2.95		
	SD = 1.025	.947	1.014		
	n = 111	123	212	29.6**	B,C
158 (Parent) FATHOCC	Mean = 57.38	48.83	65.38		
	SD = 23.04	29.47	23.32		
	n = 60	69	173	9.6625**	B
160 (Parent) TPAREDUC	Mean = 7.68	7.45	10.35		
	SD = 2.84	2.83	3.02		
	n = 63	73	182	35.1394**	B,C

** $p < .001$

[1]Confidence bands were created by adding and subtracting two standard errors of the Mean from each mean.

A = Confidence bands for Low-Achieving and LD groups do not overlap.

B = Confidence bands for LD and Normal Achieving groups do not overlap.

C = Confidence bands for Low-Achieving and Normal-Achieving groups do not overlap.

TABLE 3

Means, Standard Deviations, and F-ratios for variables associated with Ability and Achievement of Low-achieving, and LD Junior High School students

Variable Name	Low Achieving	LD	F	Overlap?[1]
Estimated IQ	Mean = 89.99 SD = 15.31 n = 108	87.90 12.07 111	1.26	Yes
Reading Cluster	Mean = 502.06 SD = 21.44 n = 109	490.57 21.06 109	15.95**	No
Mathematics Cluster	Mean = 517.08 SD = 18.47 n = 109	508.86 19.23 111	10.47**	No
Written Language Cluster	Mean = 507.09 SD = 18.15 n = 109	494.85. 20.37 111	22.13**	No

** $p \leq .001$

[1]Confidence bands were created by adding and subtracting two standard errors of the Mean from each mean.

TABLE 4

Means, Standard Deviations, and F-ratios for variables associated with ability and achievement of Low-Achieving, and LD High School students.

Variable Name	Low Achieving	LD	F ratio	Overlap?[1]
Estimated IQ	Mean = 99.08	93.02	15.30**	No
	SD = 12.33	11.44		
	n = 112	123		
Reading Cluster	Mean = 512.86	498.52	21.68**	No
	SD = 21.52	25.27		
	n = 112	122		
Mathematics Cluster	Mean = 528.57	518.20	16.16**	No
	SD = 18.10	21.14		
	n = 112	123		
Written Language Cluster	Mean = 521.47	503.22	58.64**	No
	SD = 16.60	19.43		
	n = 111	121		

** $p < .001$

[1]Confidence bands were created by adding and subtracting two standard errors of the Mean from each mean.

TABLE 5

Means and Standard Deviations for Vocabulary and Block Design Sub-tests for Junior High Students

Variable Name	Low Achieving	LD	Overlap?[1]
Vocabulary	Mean = 7.52	6.99	Yes
	SD = 2.65	2.46	
	n = 94	107	
Block Design	Mean = 9.05	8.99	Yes
	SD = 3.30	2.77	
	n = 94	107	

[1]Confidence bands were created by adding and subtracting two standard errors of the Mean from each mean.

TABLE 6

Means and Standard Deviations for Vocabulary and Block Design sub-tests of Senior High students

Variable Name	Low Achieving	LD	Overlap?[1]
Vocabulary	Mean = 8.89	7.56	No
	SD = 2.58	2.33	
	n = 104	119	
Block Design	Mean = 10.84	9.80	No
	SD = 2.76	2.80	
	n = 104	119	

[1]Confidence bands were created by adding and subtracting two standard errors of the Mean from each mean.

TABLE 7

Means and Standard Deviations Associated with the Three-way analysis of Variance of Estimated IQ scores

	JUNIOR HIGH		SENIOR HIGH	
District	Low-Achiever	LD	Low-Achiever	LD
A	Mean = 95.57	90.19	105.62	96.56
	SD = 13.59	11.84	9.48	11.66
	n = 47	59	53	57
B	Mean = 84.34	85.92	92.14	89.71
	SD = 14.21	11.26	11.00	10.32
	n = 47	48	51	62

TABLE 8

Means and Standard Deviations Associated with the Three-Way Analysis of Variance of Reading Cluster Scores

	JUNIOR HIGH		SENIOR HIGH	
District	Low-Achiever	LD	Low-Achiever	LD
A	Mean = 512.40	497.10	525.26	509.25
	SD = 15.75	18.53	19.05	23.34
	n = 47	59	53	57
B	Mean = 489.43	482.56	499.84	488.47
	SD = 21.12	21.66	16.87	23.03
	n = 47	48	51	62

TABLE 9

Means and Standard Deviations Associated with the Three-Way Analysis of Variance of Mathematics Cluster Scores

	JUNIOR HIGH		SENIOR HIGH	
District	Low-Achiever	LD	Low-Achiever	LD
A	Means = 521.79	513.53	538.19	522.53
	SD = 16.05	18.38	13.86	20.84
	n = 47	59	53	57
B	Means = 511.04	504.63	519.88	515.11
	SD = 20.42	17.94	16.56	21.24
	n = 47	48	51	62

TABLE 10

Means and Standard Deviations Associated with the Three-Way Analysis of Variance of Written Expression Cluster Scores

	JUNIOR HIGH		SENIOR HIGH	
District	Low-Achiever	LD	Low-Achiever	LD
A	Mean = 517.13	503.46	529.66	509.37
	SD = 13.79	15.54	12.92	17.75
	n = 47	59	53	57
B	Mean = 496.72	486.65	512.51	498.21
	SD = 17.39	18.43	16.11	18.32
	n = 47	48	51	62

TABLE 11

Summary of Three-Way Analysis of Variance for Estimated IQ

Source	Sum of Squares	df	M.S.	F	p
Classification (C)	1535.29	1	1535.29	11.27	.001
District (D)	8424.29	1	8424.29	61.81	< .001
Level (L)	5146.28	1	5146.28	37.76	<.001
CD	1212.61	1	1212.61	8.90	.003
CL	386.51	1	386.51	2.84	.093
DL	153.20	1	153.20	1.12	.29
CDL	0.72	1	0.72	.005	.94
Error	56693.96	416	136.28		

TABLE 12

Summary of Three-Way Analysis of Variance for Reading Cluster

Source	Sum of Squares	df	M.S.	F	p
Classification (C)	16107.53	1	16107.53	39.45	<.001
District (D)	45962.12	1	45962.12	112.58	<.001
Level (L)	11200.45	1	11200.45	27.43	<.001
CD	1122.45	1	1122.45	2.75	.098
CL	179.27	1	179.27	0.44	.508
DL	494.21	1	494.21	1.21	.272
CDL	94.52	1	94.52	0.23	.63
Error	169839.07	416	408.27		

TABLE 13

Summary of Three-Way Variance for Mathematics Cluster

Source	Sum of Squares	df	M.S.	F	p
Classification (C)	8084.73	1	8084.73	23.8	<.001
District (D)	13496.27	1	13496.27	39.73	<.001
Level (L)	13121.20	1	13121.20	38.63	<.001
CD	1063.95	1	1063.95	3.13	.078
CL	217.01	1	217.01	0.64	.425
DL	242.0	1	242.0	0.71	.399
CDL	536.96	1	536.96	1.58	.209
Error	141315.57	416	339.70		

TABLE 14

Summary of Analysis of Variance for Written Language Cluster

Source	Sum of Squares	df	M.S.	F	p
Classification (C)	22320.45	1	22320.45	82.59	<.001
District (D)	28157.47	1	28157.47	104.19	<.001
Level (L)	13752.68	1	13752.68	50.89	<.001
CD	602.41	1	602.41	2.23	.136
CL	771.25	1	771.25	2.85	.092
DL	520.25	1	520.25	1.93	.166
CDL	37.75	1	37.75	0.14	.709
Error	112474.42	416	207.25		

FIGURE 1

INTERACTION OF CLASSIFICATION AND DISTRICT FOR MEAN ESTIMATED I.Q.

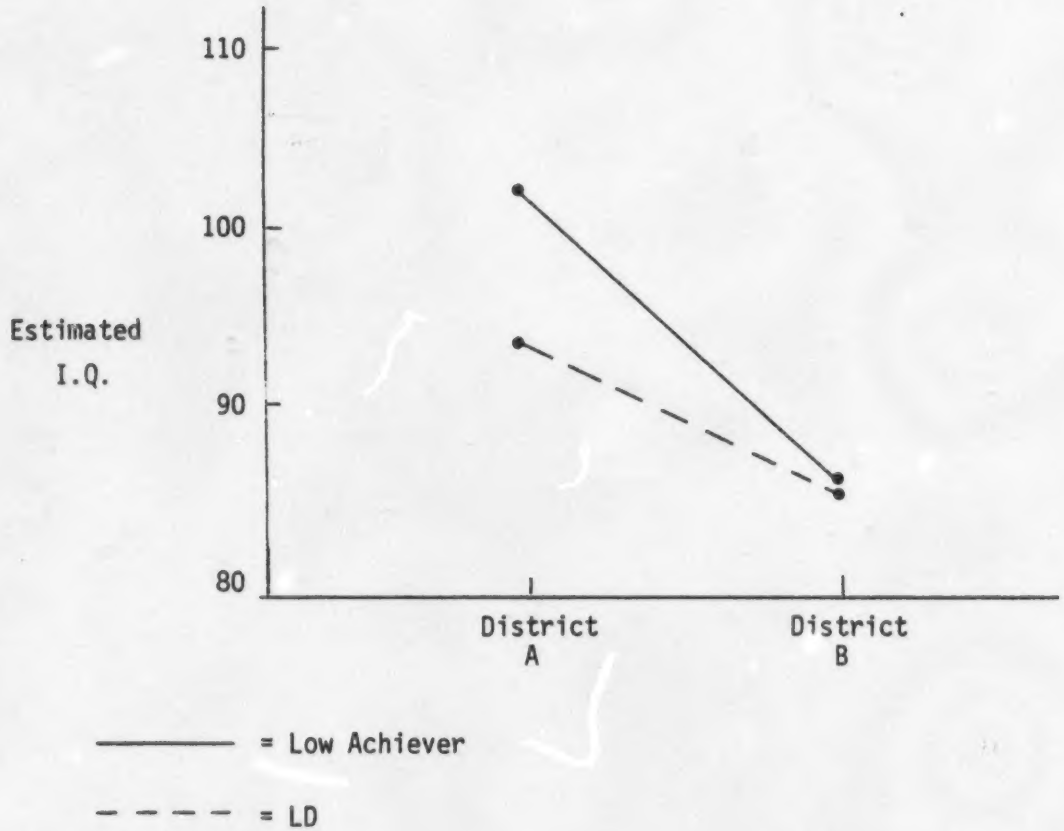

TABLE 15

Means, Standard Deviations, and Grade Equivalents for Low-Achieving and LD Students on the Reading Cluster of the Woodcock-Johnson at each grade

	Low-Achiever		LD	
Grade		G.E.		G.E.
7	m = 449.09 SD = 22.80 n = 35	4-5	m = 485.03 SD = 22.55 n = 39	3-3
8	m = 497.77 SD = 21.44 n = 35	4-4	m = 495.75 SD = 16.51 n = 32	4-2
9	m = 508.17 SD = 20.11 n = 24	5-6	m = 492.00 SD = 22.45 n = 36	3-9
10	m = 513.54 SD = 19.70 n = 35	6-6	m = 500.10 SD = 25.76 n = 41	4-6 to 4-7
11	m = 511.91 SD = 16.11 n = 34	6-6	m = 501.05 SD = 25.34 n = 41	4-8
12	m = 512.91 SD = 28.75 n = 35	6-6	m = 493.65 SD = 24.85 n = 37	4-1

Total n = 424

TABLE 16

Means, Standard Deviations, and Grade Equivalents for Low-Achieving and LD Students, on the Mathematics Cluster of the Woodcock-Johnson at each grade

Grade	Low-Achiever	G.E.	LD	G.E.
7	m = 512.6 SD = 14.30 n = 35	6-0	m = 504.79 SD = 18.68 n = 39	5-2
8	m = 517.83 SD = 22.82 n = 35	6-5	m = 507.81 SD = 15.57 n = 32	5-5
9	m = 519.92 SD = 18.90 n = 24	6-7 to 6-8	m = 516.19 SD = 19.62 n = 36	6-3
10	m = 531.51 SD = 20.31 n = 35	8-3	m = 520.95 SD = 15.32 n = 41	6-9
11	m = 527.35 SD = 14.03 n = 34	7-6	m = 517.98 SD = 27.67 n = 41	6-5
12	m = 528.71 SD = 18.45 n = 35	7-8 to 7-9	m = 516.89 SD = 19.08 n = 37	6-4

Total n = 424

TABLE 17

Means and Standard Deviations, and Grade Equivalents for Low-Achieving and LD Students on the Written Language Cluster of the Woodcock-Johnson at each grade

	Low-Achiever		LD	
Grade		G.E.		G.E.
7	m = 506.86 SD = 18.29 n = 35	5-1	m = 491.69 SD = 19.83 n = 39	3-7
8	m = 503.4 SD = 18.08 n = 35	4-7	m = 498.13 SD = 13.90 n = 32	4-2
9	m = 512.17 SD = 19.62 n = 24	5-6	m = 498.53 SD = 21.00 n = 36	4-3
10	m = 521.94 SD = 18.61 n = 35	7-0 to 7-1	m = 503.44 SD = 19.09 n = 41	4-7
11	m = 521.41 SD = 11.49 n = 34	6-8 to 6-9	m = 502.88 SD = 17.04 n = 41	4-7
12	m = 520.40 SD = 19.65 n = 35	6-7	m = 504.43 SD = 20.82 n = 37	4-8

Total n = 424

TABLE 18

Average Percentile Ranks of Students for Ability and Achievement Measures

	JUNIOR HIGH		SENIOR HIGH	
	Low-Achiever	LD	Low-Achiever	LD
Mean Estimated IQ[1]	26	22	48	32
Reading[2]	19	8	19	6
Mathematics	18	9	13	4
Written Language	15	7	19	4

[1]The mean IQ of each group was converted to its percentile rank equivalent.

[2]For each of the three Woodcock-Johnson clusters median percentile ranks are presented.

TABLE 19

Differences in Percentile Ranks

	JUNIOR HIGH		SENIOR HIGH	
	Low-Achiever	LD	Low-Achiever	LD
Reading	-7	-14	-29	-26
Mathematics	-8	-13	-35	-28
Written Language	-11	-15	-29	-28

TABLE 20

Means, Standard Deviations, and F-ratios for variables associated with Variety and Constancy of school experiences of Low-Achieving, and LD Junior High School students.

Variable No. and Name	Low Achieving	LD	Normal Achieving	F	Non-Overlap[1]
125					
PNDIFSCH	Mean = 3.38	3.71	-		
	SD = 1.67	1.97	-		
	n = 72	82	-	1.26	
126					
SUMOSCH	Mean = 2.08	2.325	-		
	SD = 1.02	1.20	-		
	n = 75	83	-	1.89	

[1]Confidence bands were created by adding and subtracting two Standard Errors of the Mean from each mean.

A = Confidence bands for Low-Achieving and LD groups do not overlap.

B = Confidence bands for LD and Normal Achieving groups do not overlap.

C = Confidence bands for Low-Achieving and Normal-Achieving groups do not overlap.

TABLE 21

Meams, Standard Deviations, and F-ratios for variables associated with variety and conctancy of school experiences of Low-Achieving, LD, and Normal-Achieving High School students.

Variable No. and Name	Low Achieving	LD	Normal Achieving	F	Non-Overlap[1]
125					
PNDIFSCH	Mean = 4.22	4.51	4.03		
	SD = 1.70	1.50	1.30		
	n = 64	77	182	3.05	
126					
SUMOSCH	Mean = 1.85	2.01	2.04		
	SD = 1.21	1.141	1.04		
	n = 66	77	183	0.77	

[1]Confidence bands were created by adding and subtracting two Standard errors of the mean from each mean.

A = Confidence bands for Low-Achieving and LD groups do not overlap.

B = Confidence bands for LD and Normal-Achieving groups do not overlap.

C = Confidence bands for Low-Achieving and Normal-Achieving groups do not overlap.